

Claims

[c1] A valve for regulating fluid flow comprising:

- a stepper motor;
- a first valve portion that includes an inlet port for receiving fluid into the valve;
- a second valve portion that includes an outlet port for dispensing fluid from the valve;
- a third valve portion located between the first valve portion and the second valve portion;
- a first member that is rotatable and operatively attached to the stepper motor; and
- a second member, having a first portion and a second portion, which is engageable with the first member for linear movement of the second member between a first position and a second position when the first member is rotated by the stepper motor, wherein the first member and the second member are located within the third valve portion and the first portion of the second member located in the first position can block fluid flow between the first valve portion and the third valve portion and the second portion of the second member located in the second position can allow fluid flow between the first valve portion and the third valve portion.

- [c2] The valve for regulating fluid flow as set forth in Claim 1, wherein the stepper motor, the first valve portion, the second valve portion, the third valve portion, the first member, and the second member are all enclosed within a housing.
- [c3] The valve for regulating fluid flow as set forth in Claim 1, further including a biasing mechanism that is in contact with the second member.
- [c4] The valve for regulating fluid flow as set forth in Claim 4, wherein the biasing mechanism includes a return spring.
- [c5] The valve for regulating fluid flow as set forth in Claim 1, wherein the first member includes a screw having a plurality of protrusions.
- [c6] The valve for regulating fluid flow as set forth in Claim 1, wherein the second member includes a plunger having a plurality of indentations.
- [c7] The valve for regulating fluid flow as set forth in Claim 6, wherein the plunger includes at least one fluid passage.
- [c8] The valve for regulating fluid flow as set forth in Claim 6, wherein the plunger includes a cylindrical portion, having an outer circumference and includes at least one protrusion on the outer circumference.

- [c9] The valve for regulating fluid flow as set forth in Claim 6, wherein the plunger includes a plurality of triangular support members.
- [c10] The valve for regulating fluid flow as set forth in Claim 2, further including a cover member that is located between the stepper motor and the third valve portion.
- [c11] The valve for regulating fluid flow as set forth in Claim 10, wherein the cover member includes at least one support portion for the stepper motor and at least one outer member that is secured to the valve housing.
- [c12] The valve for regulating fluid flow as set forth in Claim 10, wherein the cover member includes at least one protruding member that is capable of being positioned between a plurality of retaining members on the second member to restrict rotation of the second member.
- [c13] The valve for regulating fluid flow as set forth in Claim 10, further including a cover member located between the stepper motor and the third valve portion, wherein the cover member includes an outer flange.
- [c14] The valve for regulating fluid flow as set forth in Claim 13, further including a radial seal located within between the outer flange and the housing in the third valve por-

tion.

- [c15] The valve for regulating fluid flow as set forth in Claim 14, wherein the radial seal includes at least one rectangular portion and at least one c-shaped portion.
- [c16] The valve for regulating fluid flow as set forth in Claim 10, further including at least one first o-ring located between the cover member and the first member.
- [c17] The valve for regulating fluid flow as set forth in Claim 6, wherein the plunger, having an outer circumference, includes a plurality of protrusions on the outer circumference and further including at least one second o-ring located between two adjacent protrusions on the outer circumference of the plunger.
- [c18] The valve for regulating fluid flow as set forth in Claim 1, further including a terminal connector mechanism that provides at least one electrical connection to the stepper motor.
- [c19] The valve for regulating fluid flow as set forth in Claim 1, wherein the inlet port for the valve is fluidly connected to an engine and a bypass loop for controlling fluid flow into a radiator, wherein the outlet port of the valve is in fluidly connected to the radiator.

[c20] The valve for regulating fluid flow as set forth in Claim 1, wherein the inlet port for the valve is fluidly connected to a bypass loop that receives fluid flow from a engine that was pumped into the engine from a water pump, wherein the outlet port of the valve is fluidly connected to an inlet for the water pump.

[c21] A valve for regulating fluid flow comprising:
a stepper motor;
a first valve portion that includes an inlet port for receiving fluid into the valve;
a second valve portion that includes an outlet port for dispensing fluid from the valve;
a third valve portion located between the first valve portion and the second valve portion;
a first member that is rotatable and operatively attached to the stepper motor;
a biasing mechanism that is in contact with the second member;
a housing that encloses the stepper motor, the first valve portion, the second valve portion, the third valve portion, the first member, the second member and the biasing mechanism; and
a second member, having a first portion and a second portion, which is engageable with the first member for linear movement of the second member between a first

position and a second position when the first member is rotated by the stepper motor, wherein the first member and the second member are located within the third valve portion and the first portion of the second member located in the first position can block fluid flow between the first valve portion and the third valve portion and the second portion of the second member located in the second position can allow fluid flow between the first valve portion and the third valve portion.

- [c22] A valve for regulating fluid flow comprising:
 - a stepper motor;
 - a first valve portion that includes an inlet port for receiving fluid into the valve;
 - a second valve portion that includes an outlet port for dispensing fluid from the valve;
 - a third valve portion located between the first valve portion and the second valve portion;
 - a first member that is rotatable and operatively attached to the stepper motor;
 - a biasing mechanism that is in contact with the second member;
 - a housing that encloses the stepper motor, the first valve portion, the second valve portion, the third valve portion, the first member, the second member and biasing mechanism; and

a second member, having a first portion and a second portion, that is engageable with the first member for linear movement of the second member between a first position and a second position when the first member is rotated by the stepper motor, wherein the first member and the second member are located within the third valve portion and the first portion of the second member located in the first position can completely block fluid flow between the first valve portion and the third valve portion and the second portion of the second member located in the second position can allow fluid flow between the first valve portion and the third valve portion, wherein the valve is capable of controlling fluid flow going into a bypass loop and fluid flow going into a radiator.

- [c23] A valve for regulating fluid flow comprising:
 - a stepper motor;
 - a first valve portion that includes an inlet port for receiving fluid into the valve;
 - a second valve portion that includes an outlet port for dispensing fluid from the valve;
 - a third valve portion located between the first valve portion and the second valve portion;
 - a screw, having a plurality of protrusions, that is rotatable and operatively attached to the stepper motor;

a plunger, having a first portion and a second portion and a plurality of indentations, that is engageable with the plurality of protrusions on the screw for linear movement of the plunger between a first position and a second position when the screw is rotated by the stepper motor, wherein the screw and the plunger are located within the third valve portion and the first portion of the plunger located in the first position can block fluid flow between the first valve portion and the third valve portion and the second portion of the plunger located in the second position can allow fluid flow between the first valve portion and the third valve portion; a return spring that is in contact with the plunger; and a housing that encloses the stepper motor, the first valve portion, the second valve portion, the third valve portion, the screw, the plunger and the return spring.

- [c24] The valve for regulating fluid flow as set forth in Claim 23, further including a cover member that is located between the stepper motor and the third valve portion.
- [c25] The valve for regulating fluid flow as set forth in Claim 24, wherein the cover member includes at least one protruding member that is capable of being positioned between a plurality of retaining members on the plunger to restrict rotation of the plunger.

- [c26] The valve for regulating fluid flow as set forth in Claim 23, further including a cover member located between the stepper motor and the third valve portion, wherein the cover member includes an outer flange.
- [c27] The valve for regulating fluid flow as set forth in Claim 26, further including a radial seal located within between the outer flange and the housing in the third valve portion.
- [c28] The valve for regulating fluid flow as set forth in Claim 24, wherein the plunger, having an outer circumference, includes a plurality of protrusions on the outer circumference and further including at least one second o-ring located between two adjacent protrusions on the outer circumference of the plunger.
- [c29] The valve for regulating fluid flow as set forth in Claim 24, wherein the inlet port for the valve is fluidly connected to an engine and a bypass loop for controlling fluid flow into a radiator, wherein the outlet port of the valve is in fluidly connected to the radiator.
- [c30] The valve for regulating fluid flow as set forth in Claim 24, wherein the inlet port for the valve is fluidly connected to a bypass loop that receives fluid flow from a engine that was pumped into the engine from a water

pump, wherein the outlet port of the valve is fluidly connected to an inlet for the water pump.

- [c31] A method for regulating fluid flow with a valve comprising:

rotating a first member that is operatively attached to a stepper motor within a valve, that includes a first valve portion having an inlet port for receiving fluid into the valve, a second valve portion having an outlet port for dispensing fluid from the valve and a third valve portion located between the first valve portion and the second valve portion; and

moving a second member, having a first portion and a second portion, from a first position to a second position through interengagement with the rotating first member, wherein the first portion of the second member located in the first position can block fluid flow between the first valve portion and the third valve portion and the second portion of the second member located in the second position can allow fluid flow between the first valve portion and the third valve portion.

- [c32] The method for regulating fluid flow with a valve as set forth in Claim 31, further includes applying force against the second member with a biasing mechanism.

- [c33] The method for regulating fluid flow with a valve as set

forth in Claim 31, further including utilizing the valve for controlling the fluid flow from the engine into a radiator.

- [c34] The method for regulating fluid flow with a valve as set forth in Claim 31, further including utilizing the valve for controlling the fluid flow from the engine into a bypass line.
- [c35] A method for regulating fluid flow with a valve comprising:
 - rotating a screw, having a plurality of protrusions, that is operatively attached to a stepper motor within a valve, having a first valve portion having an inlet port for receiving fluid into the valve, a second valve portion having an outlet port for dispensing fluid from the valve and a third valve portion located between the first valve portion and the second valve portion; and
 - moving a plunger, having a first portion that includes a cylindrical portion and a second portion that includes at least one orifice and a plurality of indentations, that engages the plurality of protrusions on the screw for linear movement of the plunger between a first position and a second position when the screw is rotated by the stepper motor against a force applied by a return spring, wherein the first portion of the plunger located in the first position can block fluid flow between the first valve portion and the third valve portion and the second portion of the

second member located in the second position can allow fluid flow between the first valve portion and the third valve portion.

- [c36] The method for regulating fluid flow with a valve as set forth in Claim 35, further including sealing the valve with a cover member located between the stepper motor and the third valve portion, wherein the cover member includes an outer flange, a radial seal located within between the outer flange and the housing in the third valve portion, at least one first o-ring located between the cover member and the first member and at least one second o-ring located between two adjacent protrusions on the outer circumference of the plunger.
- [c37] The method for regulating fluid flow with a valve as set forth in Claim 35, further including providing electrical connections to the stepper motor through a terminal connector.
- [c38] The method for regulating fluid flow with a valve as set forth in Claim 35, further including restricting rotation of the plunger by engaging at least one protruding member on a cover member with a plurality of retaining members on the plunger, wherein the cover member is located between the stepper motor and the third valve portion.

- [c39] The method for regulating fluid flow with a valve as set forth in Claim 35, further including controlling fluid flow from an engine to a radiator with the valve.
- [c40] The method for regulating fluid flow with a valve as set forth in Claim 35, further including controlling fluid flow from an engine to a bypass loop with the valve.